

REMARKS

Information Disclosure Statement

Applicants acknowledge the examiners striking of the Sekutowksi reference (US 4,740,538) from the 2/11/02 IDS as being cited in a prior correspondence.

Election/Restrictions:

Applicants note the removal of the restriction requirement due to cancellation of the non-elected claims without prejudice or disclaimer of the subject matter thereof.

35 USC § 112:

The Examiner has objected to claims 1-15 under 35 USC 112 , first paragraph, as containing subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicants have therefore amended claim 1, to remove reference to the flexural modulus of "at least about 1130 MPa". Claim 1, is now believed to be in condition to overcome the Examiner's objection. Claims 2-15 are dependent from claim 1 and are thus believed to be in allowable condition for the same reasons as claim 1.

35 USC § 103(a):

I.

In item 7 of the Office Action, the Examiner rejects claims 1-10 and 13-15 under 35 USC 103(a) as being unpatentable over Sekutowski (US 4, 740,538) in view of Moss (US 4, 698,372). Applicants respectfully contend that the combination of these two references would not have made the present invention obvious.

Sekutowski discloses the use of filled engineering plastics that is directed toward improving impact strength. However, as the Examiner notes Sekutowski does not disclose the aspect ratio of the mineral filler as in Applicants' invention. Additionally, Sekutowski discloses an inorganic filler having separate deposits of an impact modifier and a coupling agent. The filler is incorporated into a polymer matrix to form a composition. Furthermore, Sekutowski in no way suggests the surprising aspect of Applicants' invention which is the simultaneous increase in both modulus and toughness shown in Table 4 of the present invention.

While Moss and the instant invention both deal with mineral-filled polymers, they are patentably distinct as they essentially represent non-analogous art. Moss is directed toward the making of a **"soft, tear resistant microporous film"** (col 1, lines 43-44) from a polymer having a flexural modulus of less than 200 MPa (col 2, lines 5-6). Moss encompasses copolyesters and copolyamides "in which no single monomer is present in a concentration greater than about 50% by weight." (Col 3 line 58 - Col 4 line 2). Moss does not encompass polyester, polyamide homopolymers, or polyacetals. The 50% limitation in Moss is clearly directed at low-crystallinity copolymers which meet the very low flexural modulus requirement which is what provides the desired soft film of Moss' invention.

Applicant's invention, in contrast, is clearly directed towards engineering polymers, a term which is employed several times in Applicant's invention. (Page 1 line 9, Page 1 lines 20-21, Page 1 line 28, Page 2 line 10, Page 2 line 13). "Engineering Polymer" is a term of art referring to polymers characterized by **high stiffness** (Polymer Science Dictionary, page 148, attached herewith for reference). "Engineering Polymer" encompasses polyamides, polyacetals, and polyesters which are characterized by flexural modulus of greater than 2000 N/mm^2 ($>2000 \text{ MPa}$) (ref. Encyclopedia of Polymer Science and Engineering, Volume 6, Page 101, third line from the bottom, attached herewith for reference.) The value of the flexural modulus of engineering polymers is further indicated in Table 1 of Applicant's invention. The flexural modulus of the polymers suitable for use in Applicant's invention is at least ten times greater than the maximum flexural modulus in Moss. (See Abstract and col. 2, line 5 where flexural modulus is shown as less than about 200MPa.) While Applicant's invention does not exclude, for example, copolyamides, it would be clear to one of ordinary skill in the art that copolyamides suitable for use as engineering polymers are quite unsuitable for use in Moss, and indeed Applicant's invention clearly teaches a preference for homopolymers of polyamides and polyesters which are expressly excluded from Moss. The properties of Applicant's compositions are quite unexpected with respect to the teachings of Moss. The films produced in Moss are extremely soft, satiny and textile like. Moss puts fillers and organic acids into already soft, flexible polymers, and makes them even softer and more flexible. Applicant puts the same fillers and organic acids into engineering polymers and makes them stiffer. Thus, Moss teaches away from Applicants' invention.

For the above stated reasons, Applicants contend that the polymers taught in Sekutowski are inoperable according to Moss. Thus, the combination of references renders Moss inoperable, hence, the combination does not establish a case of prima facie obviousness.

Applicant has amended claim 1, the title, *and the specification* to indicate explicitly that the invention is directed to the field of engineering polymers to further clarify the invention. Basis for this amendment has been cited hereinabove. For the above stated reasons claim 1 is believed to be in condition for allowance. Similarly, Claims 2-10 and 13-15, dependent therefrom are also believed to be in allowable condition. Reconsideration of these claims is respectfully requested.

II.

In item 8, the Examiner has rejected Claims 1~6, 9~12 and 15 under 35 U.S.C. §103(a) as being unpatentable over US 4,456,710 ("Luders") in view of Moss. Applicants disagree and believe such combination would not have been obvious to one of ordinary skill in the art.

Luders teaches the use of polyoxymethylene, an engineering polymer well-known in the art to be of high flexural modulus, combined with the use of a sulfate or sulfonate adhesion promoter to improve mechanical properties of the composition. As the Examiner notes, Luders does not disclose the mineral filler aspect ratio or the volume % of Applicants' invention. More significantly, the polyoxymethylene, due to its high stiffness, of Luders is inoperable in Moss, as is the adhesion promoter. Moss expressly teaches away from adhesion promoters in favor of so-called antagonizers which have the effect of reducing the wetting of the filler by the polymer thereby decreasing adhesion (see Moss Col 6, lines 14-16). Thus, the compositions of Luders would render Moss inoperable, and the combination of Luders with Moss improper and hence do not establish prima facie obviousness. Thus, Applicants contend it would not have been obvious to one of ordinary skill in the art to combine Luders and Moss. Hence, claims 1-6, 9-12 and 15, as amended, are believed to be in allowable condition.

III.

In item 9, the Examiner has rejected Claims 1~10 and 13~15 under 35 U.S.C. §103(a) as being unpatentable over US 5,281,379 ("Noguchi") in view of Moss and Sekutowski. Applicants respectfully disagree.

The Examiner states that Noguchi does not disclose the aspect ratio of the mineral filler nor the stearic acid. Applicants reiterate here the reasons stated hereinabove that the combination of Sekutowski and Moss is improper. Noguchi is directed to a novel process for forming mineral-filled polymers from a wide variety of polymers fillers and additives. However, the compositions of Moss, Sekutowski, and Applicant are distinctly different compositions, and no incentive is provided in the art to combine them.

While some of the polymers of Noguchi might be suitable for use in Moss, and other of the polymers might be suitable for use in Sekutowski, none of the polymers are suitable for use in both, as discussed hereinabove. Furthermore, the polymers of Noguchi suitable for Moss are not suitable for Applicant's invention.

Applicant respectfully submits that Moss does not teach an aspect ratio of less than 2. Examiner states that col 5, lines 21-23 of Moss teaches filler aspect ratio of less than 2 in order to impart **suitable reinforcing effects**. Col 5, lines 21-23 of Moss states: "Just as extended agglomerated structures induce undesirable reinforcing effects, so do fillers having high aspect ratios. The preferred aspect ratio is less than 2." Thus, Moss teaches that low aspect ratios, less than 2, do not provide reinforcing effects while higher aspect ratios do and these reinforcing effects are undesirable. In contrast, Applicant teaches these reinforcing effects are desirable.

In view of these distinctions between Claims 1~10 and 13~15 and the combined disclosures of Sekutowski and Moss, Applicant respectfully requests that the Examiner withdraw the rejection of those claims under 35 U.S.C. §103(a).

In view of the foregoing, allowance of the above-referenced application is respectfully requested.

IV.

Applicants note the Examiners response to Applicants' prior arguments and provide the above arguments in response.

Extension:

A petition under 37 CFR § 1.136 for a one-month extension of time to respond to the Examiner's action is enclosed, the fee should be charged to Deposit Account No. 04-1928 (E.I. du Pont de Nemours and Company.) If , any additional fee is due in order to obtain consideration of this response, please charge that fee to the above identified account.

Respectfully submitted,

Tamera L. Fair

TAMERA L. FAIR
ATTORNEY FOR APPLICANTS
REGISTRATION NO. 35,867
TELEPHONE: (302) 892-7948
FACSIMILE: (302) 992-3257

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In showing the changes, deleted material is shown as bracketed, and inserted material is shown underlined.

IN THE TITLE:

Please amend the title as follows:

TOUGHENED, HIGH-MODULUS MINERAL FILLED ENGINEERING POLYMERS

IN THE SPECIFICATION:

Please amend page 1, lines 4-7 as follows:

This invention relates to a polymer composition for molded articles exhibiting desirable combinations of stiffness and impact resistance. More particularly, this invention relates to a composition comprising an [a hydrocarbon] engineering polymer having [a heteroatom in the backbone and] a mineral filler.

Please amend the paragraph on page 4, lines 29-35 as follows:

In one aspect of the present invention, there is provided a composition comprising an [a hydrocarbon] engineering polymer having a backbone comprising repeat units, at least 80 mol-% of which repeat units comprise one or more oxygen or nitrogen atoms disposed in said backbone; about 1%-30% by volume of a mineral filler having an aspect ratio of 5 or less, the filler having an average equivalent spherical diameter in the range of about 0.1 to less than about 3.5 micrometers, and a saturated organic acid, salt thereof, or a mixture thereof, at a concentration of at least about 0.5% by weight of the mineral filler.

IN THE CLAIMS:

1. (twice amended) A composition comprising (a) an [a hydrocarbon] engineering polymer having a backbone comprising repeat units, at least 80 mol-% of which repeat units comprise one or more oxygen or nitrogen atoms disposed in said backbone, [said engineering polymer having a flexural modulus (as measured according to ASTM D-790) of at least about 1130 MPa]; (b) about 1%-30% by volume of a mineral filler having an aspect ratio of 5 or less, the filler having an average equivalent spherical diameter in the range of about 0.1 to less than about 3.5 micrometers; and (c) a saturated organic acid, salt thereof, or a mixture thereof, at a concentration of at least about 0.5% by weight of the mineral filler.

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10. (once amended) The composition of Claim 1 wherein the [hydrocarbon] engineering polymer is selected from the group consisting of polyacetal, polyamide, and polyester.

11. (once amended) The composition of Claim 10 wherein the [hydrocarbon] engineering polymer is polyoxymethylene homopolymer.

12. (once amended) The composition of Claim 10 wherein the [hydrocarbon] engineering polymer is a copolymer comprising repeat units of oxymethylene and up to 10 mol-% of oxyalkylene repeat units having adjacent methylene groups.

13. (once amended) The composition of Claim 10 wherein the [hydrocarbon] engineering polymer is nylon 66 or nylon 6.

14. (once amended) The composition of Claim 10 wherein the [hydrocarbon] engineering polymer is polyethylene terephthalate or polybutylene terephthalate.

15. (once amended) A [shaped] molded article comprising the composition of Claim 1.